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(54) AN ELECTRICAL PLUG AND SOCKET CONNECTOR

(71) I, WILHELM DINSE, a citizen of the Federal Republic of Germany, of Königsreihe 12, 2 Hamburg 70, Germany, do hereby declare the invention, for which we pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to an electrical plug and socket connector whose plug and socket bodies can be coupled together by insertion of one into the other followed by relative rotation.

The principal object of the present invention is to provide an electrical plug and socket connector which is for use in the welding field and which, in addition to the welding current, enables additional control and/or supply lines to be connected.

An additional object of the present invention is to provide a connector for use in a field other than welding (for example, in the medical and dentistry fields) in which, besides the electrical connection, other connections for the supply of gas, water, coolants, heating media, electricity and so on are available.

Accordingly the present invention consists in an electrical plug and socket connector, the plug body and the socket body of which are lockable to one another, when they have been positioned in axial alignment with one another, by being pushed together and turned against each other, at least two connecting ends being provided both within the plug body and within the socket body, the two sets of two connecting ends being complementary and at least one of said connecting ends in the plug body and its complementary connecting end in the socket body being electrical, the connecting ends of one of said bodies being positioned in an insert which is turnable with respect to said one body by a driving member associated with the other body.

[Price 25p]

Said driving member may consist of one of said connecting ends in said other body.

Preferably, said insert is movable from a rest position thereof axially of said other body against the influence of a spring and is only turnable after having been caused to move axially from said rest position thereof through a certain distance.

In a preferred embodiment of said connector, said insert is positioned in the socket body. Furthermore, the plug body is preferably provided with a retainer pin and the socket body is provided with a longitudinal guide groove for said retainer pin, said longitudinal guide groove communicating with a helical groove such as will, in use of said connector, coact with said retainer pin to tighten the connection of the two bodies to one another during relative angular movement between said plug body and said socket body about their common axis, said insert having an initial angular relationship with the longitudinal guide groove, and the connecting ends of the plug body being matched to this initial angular relationship by virtue of their own angular relationship with the retainer pin.

Preferably, the connector is such that, when said insert is in said initial angular relationship with said guide groove, a detent pin on the socket body is located in a longitudinal detent groove in the insert, the length of said detent groove being such in relation to that of the axial displacement of the insert by the plug body as to permit said turning movement of said insert upon completion of the said axial displacement thereof. Said detent groove is preferably formed in an annular flange which forms part of the insert and which serves as a seat for one end of the spring.

In a generally preferred embodiment of said connector, said connecting ends of the two bodies are arranged in end covers of the respective bodies. The end covers may be 90

manufactured from electrical insulating material.

Male connecting ends are preferably arranged in the insert and female connecting ends are arranged in said other body. Moreover, an external housing for the plug body extends at least as far as the connecting ends in said plug body.

One complementary pair of connecting ends is preferably disposed centrally of the connector, said pair, when connected to one another, constituting a guide tube for the endless filler rod or wire (consumable electrode) which is consumed in a welding operation. Each connecting end of said pair has a tapered form, whereby good centering is achieved.

The present invention will now be more particularly described with reference to the accompanying drawings which illustrate the application of the present invention to an electrical plug and socket connector for a shielded arc welding apparatus and in which:—

Figure 1 is a view of one embodiment of such a connector prior to the fitting together of the two parts of the connector;

Figure 2 is a section through the illustration of Figure 1;

Figure 3 is a fragment of a section similar to that illustrated in Figure 2, to a slightly larger scale, of the two connector parts after the two parts have been properly connected to one another; and

Figure 4 is an end elevation of the plug body.

The connector illustrated in the drawings consist of a plug and socket which are designed for the purpose, in addition to the purpose of carrying the relatively heavy welding current, of linking with one another several other supply lines. The plug has the various supply lines taken to it in a bunch within a sleeve 1, the actual plug body 21 being arranged within a housing 2 which projects at 20 in order to provide recessed protection of the user against contact with the exposed portion of the plug body. The housing 2 consists of rubber, a synthetic resin material or some other electrical insulating material.

The socket body 8 is likewise protected by a sleeve 3 which may be made of material identical with that of the housing 2. Furthermore, two sleeves 4 and 6 of electrical insulating material are slid on to the socket body and a fixing plate 5 on which the socket is mounted is located between said sleeves, attachment being effected by means of a spring washer 9 and a nut 7 which is screwed on an external thread formed on the socket body 8 and which is tightened up against said washer 9. Between the socket body 8 and a nut 11 which is provided with a frusto-conical portion there is clamped a

supply line 10 for the welding current, said nut 11 having an external screw-thread which mates with a complementary internal thread in the socket body. The clamping provides a satisfactory electrical connection.

The welding current line in the plug, is in the form of a hollow conductor 17 which is clamped between a conical screw 18 and a complementary clamping element or nut 19 which, in turn is screwed into and electrically connected to the plug body 21.

Extending centrally through the connector as a whole is a two-part guide tube 13 for the welding rod or wire (consumable electrode). This guide tube terminates within the plug body 21 in a connecting end 13a and within the socket body 8 in a connecting end 13b. The connecting end 13a is arranged in an end cover 25 made of a synthetic resin material in the plug body 21. Also, a line 14 for the shield gas (if used) extends through the connector as a whole, the ends of the line 14 being linked through tubular portions 24 with corresponding connecting ends 14a and 14b. The connecting end 14a is also arranged in the end cover 25. Instead of or in addition to this line 14, a line for water or some other liquid and/or a compressed air line can be provided. Finally, two electrical control lines 15 extend through the connector as a whole, these lines being clamped by screws 16 and being intended to be linked by connecting ends 15a and 15b, of which the end 15a is likewise arranged in the end cover 25. Said line 15 and the clamping screws 16 are part of an electrical circuit by means of which the welding current is switched on or off.

In the socket body 8 there is assembled an axially displaceable and angularly movable insert 12 of a synthetic resin material. This insert is displaceable axially of the socket body 8 against the load of a compression spring 33, such displacement being effected by the plug body 21 when the two bodies are pushed one into the other. Arranged in the socket body 8 is a detent pin 30 which projects into a longitudinal or axially extending detent groove 31 which is formed in a flange 29 of the insert 12. This detent pin 30 prevents angular movement of the insert 12 about its longitudinal axis until the groove 31 has been displaced to a position in which said groove is not in register with the detent pin when the two bodies are pushed one into the other. One end of the spring 33 abuts the flange 29 and the other end thereof abuts the axially inner end of the nut 11.

Centrally of the insert 12 there extends the guide tube 13 for the welding rod (consumable electrode), the end 13b of said guide tube 13 being conical or tapered and the taper angle of which is complementary to that of the end 13a.

In the socket body, an opening or bore is provided the diameter of which is equal to the external diameter of the front portion of the plug body 21. A longitudinal groove

27 (Figure 2) acts as a guide for a retainer pin 22 when the plug and socket bodies are slid together. These two bodies are then tightened into contact with one another by imparting thereto relative angular movement about the common longitudinal axis so that the retainer pin 22, which has become located at the start of a helical groove 28, is caused to move along said groove. When this happens, the socket body 8 is tightened (by continued axial movement thereof) into pressure contact with the periphery of a frusto-conical portion 26 of the plug body 21 and it will therefore be appreciated that good electrical contact is thereby established between the supply line 10 and the welding current line 17.

The establishment of the connection is effected by pushing the plug body into the socket body. As this happens, the protective projection 20 of the housing 2 enshrouds the sleeve 3, ultimately making contact with the left-hand end of the sleeve 4 (as seen in Figure 2). The retainer pin 22 is guided along the groove 27 and at the same time the associated ends 13a 13b, 14a 14b, 15a and 15b connect with one another. When the two bodies have been pushed home, one into the other, the insert 12 will have been displaced sufficiently far for angular movement thereof about its longitudinal axis no longer to be prevented by the detent pin 30 since, at this stage, said pin will have left the groove 31. When the plug body is moved angularly as already described in order to tighten it up into said pressure contact with the surface of said portion 26, the connected ends 14a, 14b, 15a and 15b act as driving members so that the insert 12 is moved angularly therewith, thereby ensuring that the connections already established by said connected ends are both maintained and are caused to move angularly in unison. By virtue of the complementary tapered ends 13a 13b, good centering is achieved. After the establishment of the connection, the condition shown in Figure 3 is obtained from which it will be seen that the plug has been moved axially in the direction and to the extent which is indicated by the arrow A and the two vertical lines between which said arrow extends as compared with the position illustrated in Figure 2. Likewise, it will be seen that the insert 12 has been axially displaced (as compared with the position thereof illustrated in Figure 2), in the direction indicated by the arrow B but to an extent which is smaller than that to which the plug has been moved and which is represented by the distance between the two vertical lines between which said arrow B

extends.

Figure 4 is an end elevation illustrating the arrangement in the plug body of the ends 15a of the electrical control lines 15, the end 14a of the shield gas line and the end 13a of the guide tube with respect to one another.

WHAT I CLAIM IS:—

1. An electrical plug and socket connector, the plug body and the socket body of which are lockable to one another, when they have been positioned in axial alignment with one another, by being pushed together and turned against each other, at least two connecting ends being provided both within the plug body and within the socket body, the two sets of two connecting ends being complementary and at least one of said connecting ends in the plug body and its complementary connecting end in the socket body being electrical, the connecting ends of one of said bodies being positioned in an insert which is turnable with respect to said one body by a driving member associated with the other body.

2. A connector as claimed in Claim 1, wherein said driving member consists of one said connecting end in said other body.

3. A connector as claimed in either of the preceding Claims, wherein said insert is movable from a rest position thereof axially of said other body against the influence of a spring and is only turnable after having been caused to move axially from said rest position thereof through a certain distance.

4. A connector as claimed in any one of the preceding Claims, wherein said insert is positioned in the socket body.

5. A connector as claimed in Claim 4, wherein the plug body is provided with a retainer pin and the socket body is provided with a longitudinal guide groove for said retainer pin, said longitudinal guide groove communicating with a helical groove such as will, in use of said connector, coact with said retainer pin to tighten the connection of the two bodies to one another during relative angular movement between said plug body and said socket body about their common axis, said insert having an initial angular relationship with the longitudinal guide groove, and the connecting ends of the plug body being matched to this initial angular relationship by virtue of their own angular relationship with the retainer pin.

6. A connector as claimed in Claim 5, wherein, when said insert is in said initial angular relationship with said guide groove, a detent pin on the socket body is located in a longitudinal detent groove in the insert, the length of said detent groove being such in relation to that of the axial displacement of the insert by the plug body as to permit said turning movement of said insert upon

completion of said axial displacement thereof.

7. A connector as claimed in Claim 6, wherein said detent groove is formed in an annular flange which forms part of the insert and which serves as a seat for one end of the spring.

8. A connector as claimed in any one of the preceding Claims, wherein said connecting ends of the two bodies are arranged in end covers of the respective bodies.

9. A connector as claimed in Claim 8, wherein the end covers are manufactured from electrical insulating material.

10. A connector as claimed in any one of the preceding Claims, wherein male connecting ends are arranged in the insert and female connecting ends are arranged in said other body.

11. A connector as claimed in any one of the preceding Claims, wherein an external housing for the plug body extends at least as far as the connecting ends in said plug body.

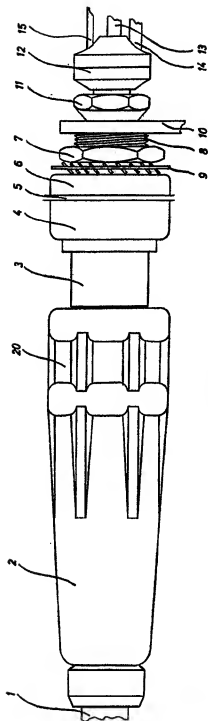
12. A connector as claimed in any one of the preceding Claims, wherein one com-

plementary pair of connecting ends is disposed centrally of the connector, said pair, when connected to one another, constituting a guide tube for the endless filler rod or wire (consumable electrode) which is consumed in a welding operation.

13. A connector as claimed in Claim 12, wherein each connecting end of said pair has a tapered form, whereby good centering is achieved.

14. An electrical plug and socket connector constructed, arranged and operable substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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*Fig. 1*

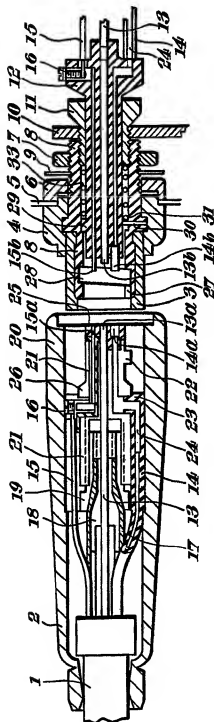
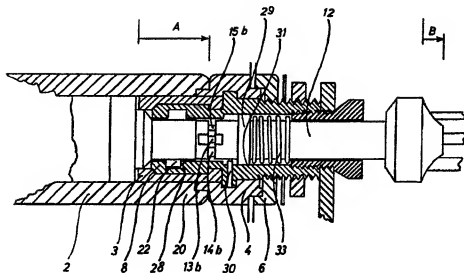


Fig. 2.

Fig. 3*Fig. 4*